CALIFORNIA DIVISION OF MINES AND GEOLOGY
FAULT EVALUATION REPORT FER-219
SUPPLEMENT No. 2

OAK RIDGE AND RELATED FAULTS
VICINITY OF FILLMORE AND SANTA PAULA
Ventura County, California

by
Jerome A. Treiman
March 15, 1999

Introduction

Revisions to the Official Earthquake Fault Zone (EFZ) for portions of the Oak Ridge fault zone (California Division of Mines and Geology, 1991a,b) were recommended by Treiman (1998). A revision of the Moorpark quadrangle was presented for review on the preliminary revised Earthquake Fault Zone Map for the Moorpark quadrangle issued on November 1, 1998. The purpose of this supplement is to present additional documentation in support of that revision. No comments were received during the official comment period ending February 1, 1999. Revision of the EFZ Map of the Fillmore quadrangle should be made when practical.

Background (repeated from Supplement No.1)

Among the features zoned in 1991 was a one kilometer long, slightly sinuous, 1.5m-high scarp-like feature that crossed the Moorpark-Fillmore quadrangle boundary in the community of Bardsdale (Figure 1a). The scarp is about one kilometer north of, and parallel to, an alignment of similar discontinuous scarps. The scarp to the south had been previously investigated and found to be associated with Holocene faulting (Yeats and others, 1986; Powell, 1991). The more northerly scarp was identified in aerial photographs and in the field. It was noted at the time that it might be related to a more obvious erosional escarpment about 2km to the east, but due to a slightly different orientation and location near a previously inferred fault trace it was decided to include the fault within a new Earthquake Fault Zone (Treiman, 1990).

Recent Findings

Dr. James Dolan (University of Southern California) has provided us with a letter (Dolan, 1998) and field log (see Appendix) documenting that the surface topographic feature identified above was the product of lateral stream erosion.

A report has also been received that was prepared for residential development within a portion of the zone to the southwest, in section 10 (AGS, 1997 – see Figure 1a). This study identified young displacements within the southwestern portion of the EFZ with 60cm vertical separation (and perhaps more) across vertical shear zones observed in Trench 1 (Figure 2). Sense of offset was up on the north (where it could be determined), opposite to what would be expected of the Oak Ridge fault, leading the consultant to infer that the observed offsets were secondary to a main fault farther north. Lesser vertical offsets (up to 15cm) were also observed south of the EFZ, in Trench 2. These showed vertical separation, down to the north, with loose silty sand within the vertical fracture zones

(Figure 2). No age determinations were made of the exposed alluvial sediments, although the consultant presumed that the exposed sediments were Holocene, noting that 2,000 year-old sediments were exposed at a depth of 4.5 feet in studies to the east (Powell, 1991). Only a single line of trenches was excavated and there was no assessment of lateral continuity of the fractures.

A new review of aerial photos of the site by this writer has led to two additional observations: 1) the fractures observed in the trenches have no apparent surface expression in the photos reviewed and therefore are not mappable; 2) tonal and vegetational features observed (in 1947 photos not previously reviewed) suggest that the southwestern zoned scarp may be erosionally modified.

Discussion

Data presented by Dolan (1998) is sufficient to justify removing the northern Earthquake Fault Zone section as recommended by Treiman (1998).

The data and observations of AGS (1997) and our own additional photo review provide information that is both for and against the presence of this fault section. The irregular scarp is much like the Bardsdale scarp to the east (which is verified as a fault related scarp) and both are roughly 0.3km from the mountain front. The trench observations of fractures with vertical displacement at the western end of this EFZ section also helps support the presence of faulting or folding in this vicinity.

The suggestion that the scarp (in section 10) may be erosional, although not proving the lack of faulting, takes away some of the impetus from the original argument for faulting. One could also argue that the offsets observed in the trenches by AGS (1997) may be liquefaction related, rather than tectonic. The log of southern offsets, in Trench 2, looks as if sand has been injected along the fractures from below (Figure 2), and the entire geometry, including possibly collapsed section in Trench 1 suggests a graben between the two sets of fractures. It should also be noted that the northern fracture set (within the EFZ) shows much greater deformation than the southern set. However, even if these features are faults, without mappability the fractures alone are not zonable (not well defined).

In balance, there remains reason to suspect that the southwestern EFZ section may be fault related, and there is not sufficient evidence at this time to justify either removing this EFZ section or expanding it to include all of the recently identified fractures.

Recommendations

No changes from the recommendation of Supplement No.1 are required. The northern EFZ section, as indicated on Figure 1a, should be deleted as recommended in Supplement No.1 (Treiman, 1998). The southern and southwestern zone sections should be retained.

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Reviewed & approved
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References

(note corrected dates for California Division of Mines and Geology (CDMG) EFZ map references)

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Yeats, R.S., Gardner, D.A., and Rockwell, T.K., 1986, Oak Ridge fault, Ventura basin, California: slip rates and late Quaternary history: in Jacobson, M.L., and Rodriguez, T.R., compilers, National Earthquake Hazards Reduction Program, Summaries of Technical Reports Volume XXIII: U.S.Geological Survey Open-File Report 87-63, pp.179-182.

Aerial Photos reviewed

U.S. Department of Agriculture		
AXI-3K-94 & -95	January 3, 1953	1:20,000
U.S. Geological Survey		
GS-FM 5-23 & 5-24	August 20, 1947	1:24,000

Appendix

Letter from Dr. James Dolan dated October 22, 1998

Field log of trench across inferred fault scarp

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

College of Letters,
Arts and Sciences

Department of
Earth Sciences

October 22, 1998

Mr. Jerome Treiman
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Los Angeles, CA, 90012

Dear Jerry,

At your request, I enclose a short description of the results of our excavation of the 1- to 2-m-high, northwest-facing scarp in Bardsdale, California, that you had previously identified as a possibly active trace of the Oak Ridge fault (Treiman, 1991; CDMG Fault-Evaluation Report). Our excavations show that this feature is a recent channel margin related to fluvial erosion by the Santa Clara River. It is not a fault-related feature, unlike the other scarps you mapped farther to the south, which our excavations clearly show to be fault-related landforms.

During May 1997 my students and I excavated a 30-m-long, 4-m-deep trench across this feature in an orange grove 20 m north of the house at 1043 Santa Paula Street in Bardsdale. The property is owned by Mr. Fred Howarth, who kindly gave us permission to conduct our studies on his property. Even before we began our investigation, we suspected that the scarp may have been fluvial in origin, because of its proximity to the active floodplain of the Santa Clara River to the north. However, because the main strand of the Oak Ridge fault observed in petroleum industry wells to the south projected to the surface near the Howarth site, we wanted to check the possibility that the scarp was a tectonic feature.

Our excavations revealed a sequence of flat-lying fluvial sands and gravels that was truncated in the central part of the trench by a listric, gently north-dipping fluvial channel edge (see enclosed field log of the trench. My apologies for sending only the field log, but since we did not encounter a fault, we did not spend the time to draft the trench log). The channel edge projects to the surface at the scarp, and appears to be responsible for formation of the scarp. The sediments were quite friable, requiring benching of the exposure for safety, and exhibited no evidence of soil development, save a 40-50 cm-thick dark brown A horizon, which appeared to be related to the the orange trees presently growing on the site. Based on the complete absence of any B horizon development, and the very friable nature of the sediments, we suspect that the material is very young, possibly historical. Just so you know, we collected about a dozen charcoal samples from the trench, but we did not date any of them.

I hope this answers your questions concerning the origin of the scarp that you mapped. Based on our excavations, it is clearly a fluvial channel edge, not a tectonic fault or fold. I hope this information is of use to you. Please feel free to call me with any further questions.

Sincerely,

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